2007 TECHNICAL ENGINEERING ANALYSIS GUIDELINES

For use with Technical Engineering Analyses contract dates after January 1, 2007

Department of Natural Resources
Energy and Waste Management Bureau
Wallace State Office Building
502 E. 9th Street
Des Moines, Iowa 50319-0034
(515) 281-5145
Fax (515) 281-8895

TABLE OF CONTENTS

BUILDING ENERGY MANAGEMENT PROGRAMS

The Iowa Department of Natural Resources (Department) administers the State of Iowa's Building Energy Management (BEM) Programs. The goal of the BEM Programs is to improve energy efficiency and reduce energy costs for taxpayer supported facilities. The Programs provide access to low interest financing needed to identify and implement technically feasible, cost-effective energy management improvements[1] (EMI). The Programs have established agreements with private sector legal and financial resources that make the necessary funds available to BEM clients including public and private schools, community colleges, local governments, hospitals, public and private colleges, state facilities, and nonprofit organizations[2]. Iowa Code Section 473.20, subsection 1, states (emphasis added):

"The department may make loans to the state, state agencies, political subdivisions of the state, school districts, area education agencies, community colleges, and nonprofit organizations for implementation of energy conservation measures identified in a ***comprehensive*** *engineering analysis.* ***Loans shall be made for all cost-effective energy management improvements****. For the state, state agencies, political subdivisions of the state, school districts, area education agencies, community colleges, and nonprofit organizations to receive a loan from the fund,* ***the department shall require completion of an energy management plan including an energy audit and a comprehensive engineering analysis.*** *The department shall approve loans made under this section."*

Therefore, BEM Programs are able to provide financing for all cost-effective energy projects in public facilities that are identified in a comprehensive facility analysis, completed according to Department guidelines, and approved after a technical review.

Notes:

1. Refer to the Department's *Guidelines for Cost Effective Energy Management Improvement Projects*.
2. While Iowa Code enables nonprofit organizations to work through the Energy Bank, the inability of a nonprofit to raise taxes and/or produce revenue, may impact financing terms available to implement energy management improvements. Although nonprofit organizations are identified in Chapter 473.20, the Code does not require private financial institutions to offer non-profits the same financing terms as taxpayer supported entities.

The Technical Engineering Analysis (TEA) is a comprehensive energy study that must be completed and approved by the Department before financing can be authorized. The final product of the TEA is the Energy Management Plan (EMP). The EMP represents the plan of action for the client with the analyst's recommendation whether to implement and then when to implement each EMI. The EMP is then used by the Department to authorize financing allowed by Iowa Code through BEM Programs.

Technical Engineering Analysis

The process of doing the TEA involves conducting a detailed energy survey of a facility, identifying operation and maintenance (O&M) procedure recommendations, and proposing EMIs. In order to be comprehensive, TEAs conducted in accordance with these guidelines are required to consider EMIs from a list of prescribed building categories. The scope of a TEA is to include a description and assessment of current energy consumption, the facility and its use, energy-using systems, current and proposed O&M procedures, past energy efficiency projects implemented, a prescribed list of EMIs, and an EMP.

The Department recommends the prompt installation of all cost-effective EMIs. Frequently, clients seek financing and installation long after completion of the TEA. However, the financial assistance available through the Department is fixed at the time the TEA is completed. Therefore, timely installation of EMIs is recommended. If additional funding is required due to a delay in implementation, the client will be responsible for costs associated with updating the EMI or TEA. After 48 months from the date of the technical review approval, the Department requires an all new TEA be completed. The client will be responsible for the cost of the new TEA.

Required Documents

The following documents will be needed in the preparation of a TEA report:

1. The current *Technical Engineering Analysis Guidelines* (Guidelines) booklet and any letters or other documents which serve to supersede or revise it. A current copy of the Guidelines can be accessed at the Energy and Waste Management Bureau's website at: http://www.iowadnr.com/energy/news/publications.html
2. The current *Technical Engineering Analysis Web Submission Instructions* (if the report is to be submitted on-line) available at: http://www.iowadnr.com/energy/news/publications.html
3. Utility and energy bills (electricity, natural gas, LP, fuel oil, etc.) from the last 12 month period or fiscal year (copies of which are to be included in the appendix of the report). Three years of energy billing history is preferred but only one year is required.
4. As-built drawings or another source of descriptions of building envelope components.
5. Information on utility incentive programs, if available.
6. Information on building codes or local zoning ordinances which may restrict the installation of renewable resource systems.
7. The Request for Proposals (RFP) from the client (a copy of which is to be included in the appendix of the report).
8. The signed client-analyst TEA contract (a copy of which is to be included in the appendix of the report) indicating the cost of the analysis and contract ending date.

Depth of Study

The TEA report shall evaluate a list of prescribed building categories. For each category, the report is to provide a review of existing O&M procedures and provide recommendations for improvements. The report then includes EMIs for energy or cost saving opportunities. The report is to present improvement opportunities for each prescribed category or explain why opportunities are not appropriate for the facility.

Items Not Required

Items not required (but may be included) in the report are:

- A copy of previous energy audits
- Review of previous energy audits
- Copies of utility rate tariffs

Qualifications for Analysts

To be qualified to do a TEA for BEM Programs a prospective analyst must be a licensed Professional Engineer or Registered Architect in the State of Iowa and be able to demonstrate competency in energy analysis and EMI development. For other program qualification requirements, refer to the Appendix.

The Technical Engineering Analysis Process

Program Enrollment

- Either the program marketer or the analyst brings the client into the program.
- The program marketer develops an Energy Use Index (EUI), in Btu/sq.ft.-year, for each prospective facility in order to determine the energy savings potential. Based upon the EUI, the client and the marketer identify a preliminary project scope to be incorporated into the RFP to select an analyst (when applicable).
- The client signs a Memorandum of Agreement (MOA) with the Department.
- An RFP is issued to select an analyst or the client can use any engineer or architect who is currently on the qualified list or is eligible to be placed on the qualified list (when applicable).
- In the case of facilities served by an investor-owned utility, the Department sends a *Request for Financial Assistance* application for recovering all or a part of the cost of the energy study.
- The Program marketer facilitates the execution of a TEA contract between the client and the analyst (and, if applicable, MidAmerican Energy) to determine the TEA's scope and to negotiate a cost and a completion date.

Technical Engineering Analysis

- The analyst conducts the analysis in accordance with the TEA contract and Department Guidelines.
- The analyst develops the EMP. As the plan of action for the client, the EMP must encompass all facilities studied under the client-analyst TEA contract. The EMP summarizes each EMI completed under the TEA contract. The EMP indicates whether EMI's are cost-effective according to Department guidelines, and shows the analyst's recommendation for implementation.
- The analyst submits a hard copy of report to the Department and, if applicable, the *Technical Engineering Analysis Online Data Submittal Certification*.

Technical Review

- The analyst will then submit the TEA and the EMP to the Department for review at which point the technical review can begin. (In the case of an on-line submission the review process begins upon receipt of the report appendices.) The goal of the program is for the entire review process to be completed within 30 calendar days including initial technical review, analyst revisions (if needed), technical review of requested revisions, and approval.
- The Department reviews the submission within 10 calendar days. Upon review completion, the Department may provide comments, questions, and revision requests for response by the analyst.
- The analyst makes any corrections, clarifications, or revisions to the TEA and EMP, as requested by the Department within 10 calendar days. Substantial revisions, such as the re-submission of reports, returns the review process to the beginning.
- Further revisions may be requested by the Department, as required.

- Upon successful review completion, the Department provides an approval letter to the analyst. When report revisions are required, the Department may request that a final copy of the report be submitted incorporating all revisions before final approval will be granted.

Implementation of EMIs

- The analyst presents the client with the approved TEA report(s) to explain study findings and to provide recommendations for implementation of building improvements.
- The marketer and client review the TEA and EMP to identify which EMIs can be financed through the Energy Bank.
- The Department completes a finance letter that defines a list of projects that can be financed and the amount authorized. This letter is sent to legal and financial authorities that work with the program. However, this does not preclude the possibility of financing from a local bank of the client's choice.
- Design professionals are secured by the client to plan the installation of EMIs, to facilitate the procurement process, and to hire contractors.
- Since the Department's financial assistance is fixed at the completion of the TEA, prompt implementation of all cost-effective EMIs is highly recommended. Delays beyond 48 months will require a new TEA to be completed.

TECHNICAL ENGINEERING ANALYSIS GUIDELINES

The format of each TEA report is to be similar to the format of these guidelines (with the exception of on-line submissions, the format of which are determined by the on-line system). Information is to be clearly presented and understandable to all parties in the process. TEA reports are to be stand-alone documents, meaning that they are to include all information needed for the review, future reference, etc.

The order of sections and appendices are:

Section 1 Certification
Section 2 Identification
Section 3 Executive Summary
Section 4 Building Description
Section 5 Current Energy Consumption
Section 6 Operation and Maintenance (O&M) Review and Recommendations
Section 7 Energy Management Improvements
Appendix A Calculations and Supporting Documents
Appendix B Other Supporting Information
Appendix C RFP and TEA contract

A TEA conducted in accordance with these Guidelines is intended to be a comprehensive evaluation of a facility. The scope of a TEA is to include a description and assessment of:

- current energy consumption
- the facility and its use, occupancy, etc.
- energy-using systems
- current and recommended O&M procedures
- past energy efficiency efforts and project implementations
- EMIs from each of the following prescribed categories (or documentation explaining why there are no energy management improvement opportunities for the category)

Below is a listing of the prescribed EMI categories. **A separate EMI is required for each EMI type.** (Refer to *Section 7* and the EMI Codes in the Supplement section for more information).

- Building Envelope
- Primary Heating System (including ground-source heat pump)
- Primary Cooling System (including ground-source heat pump)
- Air/Hydronic Distribution System
- Control System (night setback, scheduled fan operation, zoning, etc.)
- Domestic Hot Water System
- Water-Using Systems
- Lighting System (efficiency retrofits/replacements including exit signs and lighting controls (such as occupancy sensors, timers, and daylighting sensors))
- Other Energy Consuming Systems (wind turbines, solar energy, etc.)
- Occupancy Pattern and Schedule

Section 1: Certification

This section consists of the *Analyst Statements* forms and the analyst's certification. The *Analyst Statements* form is intended to serve as a checklist for some basic guideline requirements. **All items are to be addressed by check off or indicated as not applicable**.

The checklist is integrated into the logic of the web system error messages that ensure that all categories have been addressed. Refer to the *TEA Web Submission Instructions*.

Analyst Statements - Part 1

Institution _____ Building _____

I have included the following required information:

Identification:

__ Identification Page

Executive Summary:

__ Narrative summary
__ A listing of any known local zoning ordinances and building codes which may restrict the installation of renewable resource systems
__ Fuel Consumption and Cost Data form
__ List of EMI Savings and Costs -- Part 1
__ List of EMI Savings and Costs -- Part 2

Building Description:

__ Narrative description of facility, R values, energy-using systems, occupancy patterns, and controls
__ Building Plan View
__ Construction History form

Current Energy Consumption:

__ Electricity and Fuel Consumption History forms
__ Photocopies of the utility bills for the previous fiscal year
__ Energy End Use Profile

Operation and Maintenance Review and Recommendations:

__ O&M Procedures
__ O&M Savings

Energy Management Improvements:

__ All Scope-of-Work items have been addressed as required in the TEA RFP and TEA contract
__ EMI Development Sheets for **each** EMI type (refer to EMI Codes)
__ Management fees are listed separately, such as for performance contracts or for construction management services
__ Lamp and ballast prices that are no higher then those available through the state contract

Analyst Statements - Part 2

Institution _____ Building _____

I have considered the following O&M and EMI areas and I have included a recommendation for change or a statement that I could find none.

Operation and Maintenance:

__ Building Envelope
__ Primary Heating System
__ Primary Cooling System
__ Air/Hydronic Distribution System
__ Control System
__ Domestic Hot Water System
__ Water-Using Systems
__ Lighting System
__ Other Energy Consuming Systems
__ Occupancy Pattern and Schedule

Prescribed Energy Management Improvements

__ Building Envelope
__ Primary Heating System (including ground-source heat pump)
__ Primary Cooling System (including ground-source heat pump)
__ Air/Hydronic Distribution System
__ Control System (night setback, scheduled fan operation, zoning, etc.)
__ Domestic Hot Water System
__ Water-Using Systems
__ Lighting System (efficiency retrofits/replacements including exit signs and lighting controls)
__ Other Energy Consuming Systems
__ Occupancy Pattern and Schedule

If a swimming pool is present in the facility, I have considered

__ Swimming pool cover
__ Heat recovery ventilation
__ Solar pool heating systems
__ High efficiency heating equipment
__ Humidity control
__ Efficient pumps and motors
__ Temperature adjustment

Appendix

__ RFP
__ Technical Engineering Analysis Contract

Energy Management Plan

__ All EMIs under the current contract are listed, each account for interaction, and my recommendation for each is indicated.

The energy prices used in the Technical Engineering Analysis are

__ Marginal prices, or
__ Average price

I ___ **have** / ___ **do not have** conflicting financial or other interests with this program or with any energy efficiency recommendation made in this report.

Analyst Statements - Part 3

Institution _____ Building _____

Certificate of Responsibility

Professional Engineer

SEAL	I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa. (signature)_____(date) Printed or typed name My license renewal date is December 31, _____. Pages or sheets covered by this seal: _____ _____ _____

Registered Architect

SEAL	I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly registered architect under the laws of the state of Iowa. Printed or typed name _____ Signature _____ Date _____ Registration Expires _____ Date Issued _____ Pages or sheets covered by this seal: _____ _____ _____ _____

Section 2: Identification

The *Identification Page* (see page 13) provides contact information for all parties involved in the project. A list of county numbers is included in the Supplement section of this booklet for use in completing the form. This form also provides basic utility account information.

Identification Page

Institution _____ Building _____

Institution
(Community School District, Area Education Agency, Community College, Hospital, Non-profit, Local Government, State Facility or Agency)

Name _____ Institution Number _____
Address _____ County Number _____
City _____ State _____ Zip _____
Contact Person _____ Title _____
Email Address _____
Telephone _____ Fax _____

Building

Name _____ Building Number _____
Address _____ County Number _____
City _____ State _____ Zip _____
Contact Person _____ Title _____
Email Address _____
Telephone _____ Fax _____

Energy Suppliers

Natural Gas Supplier: _____ Account Number: _____
Meter Number: _____
Electricity Supplier: _____ Account Number: _____
Meter Number: _____
Other Energy Supplier: _____ Account Number: _____
Account Number: _____

Technical Engineering Analyst and Technical Support Personnel

Firm Name _____
Analyst's Name _____
Email Address _____
Support Person _____
Support Person _____
Telephone _____
Fax _____

Section 3: Executive Summary

This section is to be written for use by the building's owner and operator. It is to include a description of known legal barriers to the adoption of renewable resource systems.

The Executive Summary is to include:

- A summary of important findings of the report
- The analyst's general comments about current energy management practices and the potential for improvement, and
- A summary of the projects, the projected savings, and the investment required.

The Executive Summary includes the following two forms:

Fuel Consumption and Cost Data Form (see page 15)
This form provides a place for a summary of the results of the study. This form provides a location to evaluate claimed energy and cost savings against current energy consumption. This form should exclude the results of wind turbine or similar EMIs (photovoltaics) that may be misleading or distort the adjusted building energy consumption baseline. The table provides a place to calculate and present the total effect of the **recommended** EMI projects if all were to be implemented. The first line of the table shows the energy use and cost experienced during the base year, the year for which bills are presented. **Energy use computer models must match the base year consumption within ± 10 percent**. The next line shows the savings or costs associated with O&M recommendations including interaction. The third line shows the savings or costs associated with **recommended** EMI projects implemented including interaction. The fourth line shows the projected building energy consumption. The last line of the table shows the potential savings quoted in terms of percentages saved. Following the table are places to present the change in energy consumption per square foot.

List of EMI Savings and Costs Form (see page 16)
This form summarizes all analyzed EMIs. This form includes a summary of costs, estimated energy and cost savings, useful life and simple payback period. Management fees must be listed separately, such as for performance contracts through Energy Service Companies or for construction management services. The order projects are presented must be the same as the order that EMI interaction is considered. The non-energy savings column is for maintenance savings, water savings, or other non-energy items. The EMI type is a three letter code. The EMI code and the useful life to be used can be found in the Supplement section of the Guidelines.

Fuel Consumption and Cost Data

Institution _____ Building _____

	Elec. (kWh/yr)	Nat. Gas (Therms /yr)	#2 Oil (gal/yr)	Other (____/yr)	Water (cu ft/yr)	MMBtu/yr	Cost ($/yr)
Base year consumption							
O&M Savings or (costs)							
Recommended EMI savings or (costs)							
Projected consumption after EMI & O&M savings							
Total percent savings							

Gross conditioned area: _____ square feet

Base year consumption per square foot: _____ Btu/sq.ft./year

Projected consumption per square foot: _____ Btu/sq.ft./year

List of EMI Savings and Costs

Institution _____ Building _____

Part 1

EMI #	Page	Project Title	Electricity Savings		Demand Savings		Natural Gas Savings		Non-Energy Savings
			kWh/yr	$/yr	kW	$/yr	Therms /yr	$/yr	$/yr

Part 2

EMI #	EMI Type	EMI Material Cost	EMI Labor Cost	EMI Design Cost	Manage-ment Fee *	EMI Rebate	Net EMI Cost	Savings ($/yr)	Simple Payback (Years)	EMI Useful Life

* Management fee includes Energy Services Company (ESCO) or performance contract overhead and profit charges, and/or construction management costs.

Section 4: Building Description

Systems Description

Provide a description of each energy consuming system in the facility and assess its condition. System descriptions should be referenced to the building area, building addition, etc. (see the Construction History form). The description of the building envelope should include the walls, windows, doors, roofs, etc., and the R-values of each. List all the R-values which contribute to the total R-value for each building component and include the listing in the report.

Provide a description of each of the following:

- Building Envelope (including walls, windows, doors, roofs, etc., and the R-values of each)
- Primary Heating System
- Primary Cooling System
- Air/Hydronic Distribution System
- Control System
- Domestic Hot Water System
- Water-Using Systems
- Lighting System
- Other Energy Consuming Systems (such as laundry, kitchens, and swimming pools)
- Occupancy Pattern and Schedule (categorized by building area, building addition, etc.)

Occupancy Description

Provide a description of the occupancy patterns and schedules for each area of the facility. Occupancy descriptions should be categorized by building area, building addition, etc. (refer to the Construction History form)

Building Plan

A plan view of the building is to be included in this section (a sketch is acceptable). These plans are usually readily available for school facilities. Identify the building parts named in the facility and occupancy descriptions. Identify the locations of recommended EMIs whenever possible.

Construction History

The Construction History form (page 18) is to be filled out to identify the year of construction and square footage of the original building and each building addition. The analyst is to investigate and report plans for changes in building function, occupancy, etc., or the date that the building is to be vacated or abandoned and enter it on the form. If the remaining useful life of the building is less than 20 years then provide an explain. This information must be considered as the analyst provides recommendations for EMI implementation.

Construction History

Institution _____ Building _____

Original Building Construction Date _____ Year _____ Gross Square Footage

Dates additions/renovations were constructed

_____ Year _____ Gross Square Footage

_____ Year _____ Gross Square Footage

_____ Year _____ Gross Square Footage

_____ Year _____ Gross Square Footage

Total gross floor area _____ square feet

Date of anticipated change in building function, occupancy, etc., or the date that the building is to be vacated or abandoned: _____ month/year

or

Remaining useful life of building: _____ years

Section 5: Current Energy Consumption

This section is to include energy consumption history billed for the facility as well as a breakdown of consumption by end use. This section consists of:

1. Electricity Consumption History form (see page 20)
2. Fuel Consumption History form (see page 21)
3. Photocopies of utility bills
4. Energy End Use Profile form (see page 22)

Electricity and Fuel Consumption History Forms
Provide the history of electricity and fuel purchases for the most recent 12 month period or state fiscal year (July 1 to June 30). Use a separate table for each meter serving the facility. Enter the account number and meter number. Photocopies of the utility bills must be included.

Energy End Use
Provide a breakdown of the end uses of the energy purchased. The energy end use can be estimated from a plot of the bills and inventories of equipment, but computer modeling may be necessary. The minimum list of categories to address for natural gas are heating, service hot water, and kitchen use. The minimum list for electricity is cooling, lighting, and office equipment. Additional categories may be added when circumstances warrant.

Modeling
Computer software modeling is frequently required. In the case of primary heating system, primary cooling system, or distribution system replacement or major retrofit, modeling of the existing energy consumption is required. The software model is required to have first modeled the existing systems. The model should provide a close match (within ±10%) to the energy consumption history for each energy type consumed. This ensures that assumptions made are reasonably accurate and that the analyst is familiar with the operation of the facility. The model can then be used with some confidence in determining EMI energy savings.

Multiple Building Metering
Accurate energy allocation for multiple buildings served by a single meter can be difficult. The analyst is to provide an explanation of assumptions made and calculations of the allocation. The engineering staff of the Department's Energy and Waste Management Bureau is available for consultation in such cases. Contact Lee Vannoy at (515) 281-6559.

Electricity Consumption History

Institution _____ Building _____

Electricity Supplier: _____

Account number: _____ Meter number: _____

	Meter	Electricity		Demand	
Month / Year	Read Date	kWh	Cost	KW	Cost
July					
August					
September					
October					
November					
December					
January					
February					
March					
April					
May					
June					
Totals					
Averages			$/kWh		$/kW

Fuel Consumption History

Institution _____ Building _____

Fuel Supplier: _____

Month / Year	Fuel Type: _____ Account Number: _____ Meter number: _____ Meter Read Date	Units: _____	Cost	Fuel Type: _____ Account Number: _____ Meter number: _____ Meter Read Date	Units: _____	Cost
July						
August						
September						
October						
November						
December						
January						
February						
March						
April						
May						
June						
Total						
Average			Unit Cost			Unit Cost

Energy End Use Profile

Institution _____ Building _____

Electricity	kWh	MMBtu	Cost	% of Total Cost	% of Electricity	% of Total Energy
Lighting						
Cooling						
Office Equipment						
Other						
Subtotals					100	
Fuel _____	Units _____	MMBtu	Cost	% of Total Cost	% of Fuel	% of Total Energy
Heating						
Domestic Hot Water						
Kitchen						
Other						
Subtotals					100	
TOTALS				100	N/A	100

Section 6: Operation & Maintenance Review and Recommendations

This section includes a description and review of current O&M procedures in order to find deficiencies and provide recommendations for improvement before projects that will require capital investment are considered. All text is to be specific to the facility under review and must not to be generic comments. Generic comments that are incorrect or inaccurate about the facility are detrimental to the credibility of the report and undermine potential implementation and resulting savings. **Consequently, generic comments are considered a "substantial error" and can be grounds for disqualification of an analyst.** Savings calculations are useful, but not required. The findings are to be presented on the *Operation and Maintenance Procedures* and *Operation and Maintenance Savings* forms.

In order to make the TEA report comprehensive, consider each of the categories listed below. There must be at least one O&M from each of the categories or a statement indicating that the category was considered but that no deficiencies in O&M procedures were found.

- Building Envelope (including weather stripping, low-E window film, etc.)
- Primary Heating System (including ground-source heat pump)
- Primary Cooling System (including ground-source heat pump)
- Air/Hydronic Distribution System
- Control System (night setback, scheduled fan operation, zoning, etc.)
- Domestic Hot Water System (including water heater blankets)
- Water-Using Systems
- Lighting System (efficiency retrofits/replacements including exit signs and lighting controls (such as occupancy sensors, timers, and daylighting sensors))
- Other Energy Consuming Systems (wind turbines, solar energy, etc.)
- Occupancy Pattern and Schedule

Operation and Maintenance Procedures

Institution _____ Building _____

Building Envelope

Primary Heating System

Primary Cooling System

Air/Hydronic Distribution System

Control System

Domestic Hot Water System

Water-Using Systems

Lighting System

Other Energy Consuming Systems

Occupancy Pattern and Schedule

Operation and Maintenance Savings

Institution _____ Building _____

O&M Name or No.	Fuel type and units	Savings (units/yr)	Savings (MMBtu/yr)	$/unit	Savings ($/yr)
Totals	**N/A**	**N/A**		**N/A**	

Section 7: Energy Management Improvements

In order to ensure that reports are comprehensive the technical engineering analyses conducted in accordance with these guidelines are required to consider a prescribed list of EMIs. This report section must include the following prescribed EMIs or document why it is not appropriate for the facility.

Prescribed EMIs (**separate EMIs for each EMI Code**)

- Building Envelope
- Primary Heating System (including ground-source heat pumps) (refer to Special Cases section below for more information)
- Primary Cooling System (including ground-source heat pumps) (refer to Special Cases section below for more information)
- Air/Hydronic Distribution System
- Control System (night setback, scheduled fan operation, zoning, etc.)
- Domestic Hot Water System
- Water-Using Systems (shower, water closets, urinals, flow rate)
- Lighting System (efficiency retrofits/replacements including exit signs and lighting controls (such as occupancy sensors, timers, and daylighting sensors)) (**separate EMIs for each lighting type**)
- Other Energy Consuming Systems (such as laundry, kitchens, and swimming pools) and items as required in the TEA RFP and TEA contract.
- Occupancy Pattern and Schedule

EMI Development Sheets
This section consists of two-part EMI Development Sheets for each EMI (page 30 and 31). There is to be a separate EMI for each EMI code. The useful life listed with the EMI code must be used, with some exceptions (but never without supporting documentation). See the listing of EMI codes and useful lives in the Supplement section of these guidelines.

Description of Existing Conditions
A thorough description of the existing conditions of each EMI must be given including type, capacity, age, and condition of equipment. Quantities and locations of items to be replaced or modified are to be listed. This is particularly true of items distributed through the building, such as light fixtures, windows, and terminal boxes. The description of the existing lighting systems must include controls in use, such as occupancy sensors, dimmers, etc.

Description of Energy Management Improvement
A thorough description of the proposed improvement is to be provided including capacity and type of equipment or components to be retrofitted or installed. Quantities and locations of new items or items to be replaced or modified are to be listed.

Savings Calculations
Energy and cost savings calculations must be clearly presented. Assumptions must be explained. Supporting documentation is to be placed with the EMI with the possible exception of computer input and output (which can be placed in the Appendix). The energy savings calculations must account for EMI interaction. EMIs should be put in a logical order of implementation and the savings for each EMI should be calculated assuming the previous recommended EMIs have been implemented.

The unit energy costs used in savings calculations may be either average or marginal energy costs. (Marginal cost is the cost of the last energy purchased, which will also be the first energy saved.) However, marginal costs are preferred since the use of average prices will tend to overstate cost savings. Utilities show the block rate price structure on their bills so that marginal prices are known. In this case the marginal price must be used to estimate energy cost savings.

The non-energy impacts of improvements may significantly affect the cost savings of an improvement, either positively or negatively. When these items result in real cost savings, they should be identified and included in the cost savings. Savings, such as the elimination of maintenance service contracts that will no longer be needed as a result of the improvement can be used when documented. In-house labor savings, such as routine maintenance cost avoidance, cannot be used. Assumptions are to be clearly stated and explained. All energy and non-energy cost savings will be used together in the calculation of one simple payback period.

Cost Presentation

The EMI cost is to be comprised of all ownership costs that occur within the payback period. A detailed cost breakdown must be documented for each EMI including material, labor, design costs and management fees. Design costs are not to include construction management costs. Disposal costs should be identified and included. Management fees, such as those in performance contracts and fees for construction management are to be listed as a separate line item. The source of the cost information must be provided.

Market prices should be used in all lighting EMIs when available. A good source for lamp and ballast prices is the state contract. All political subdivisions of the state are eligible to buy lamps and ballasts at the state contract rate. When preparing a TEA for a public school district, local government, etc., the prices used should be no higher than those available on the state contracts. The purchasing agent in charge of the applicable contracts for the State of Iowa is Sharon Downey (515) 281-5982.

- Lamp Contract #1187
- Ballast Contract #2043

If a utility rebate applies to the EMI, include it as an entry in the EMI development sheet and use it as one of the factors in calculating the net EMI cost.

In-house labor is considered a sunk cost to the operation of an organization. Therefore, its dollar value should **not** be included in the simple payback calculations. The change in labor hours is useful information to the client and should be reported in hours saved per year.

Simple Payback Period Calculation

The simple payback period is found by dividing the net EMI cost by the total annual cost savings. Some EMIs that are not cost-effective (with payback periods in excess of the anticipated useful life) may be recommended by the analyst and desired by the client. However, this does not preclude the Department from assisting on the energy savings in the form of partial financing or in aggregating these projects with short payback EMIs. Refer to the Special Cases section below for more information on partial financing.

Useful Life and Salvage Value

Typical useful lives for various types of equipment and/or systems are provided in the EMI Codes and Useful Lives table in the Supplement section of these guidelines. The useful life listed with the EMI code must be used, with some exceptions, but never without substantial supporting documentation.

Salvage value or disposal cost at the end of the useful life is to be provided, if known.

Special Cases

Partial Financing

The *2007 Guidelines for Cost-Effective Energy Management Improvement Projects* defines cost-effective as the "the ability to recoup the actual or projected cost of construction and acquisition of the improvement (including the cost of the engineering plans, specifications, etc.) within the useful life of the improvement, or the incremental cost of the lowest life cycle cost design alternative." In cases where the simple payback exceeds the anticipated useful life of the improvement, the client may still finance the energy aspect of the project through partial financing (if appropriate). The amount of partial financing available from BEM Programs is determined by the product of the annual energy savings and the anticipated useful life of the improvement. A better option than partial financing an individual project is to aggregate (or bundle) the project with other EMIs with shorter simple paybacks. Aggregating will provide the maximum amount of financing that can be authorized.

Commissioning

The Building Commissioning Guide sponsored by the U.S. General Services Administration and the U.S. Department of Energy (draft version 2.1) contains the following definition of building commissioning:

> *In the broadest sense, a process for achieving, verifying, and documenting that the performance of a building and its various systems meet design intent and the owner and occupants' operational needs. The process ideally extends through all phases of a project, from concept to occupancy and operation.*

When applied to existing buildings this process is often called re-commissioning or retro-commissioning. Many older buildings do not have a comprehensive set of documents and maintenance procedures, the function of rooms may have changed over time, or equipment and controls are not working as designed. The analyst should consider the benefits of bringing the mechanical and electrical systems back to the original design intent or modify them to match current needs. The analyst should also provide documentation so that systems can be maintained by building operators.

Ground-Source Heat Pumps

Retrofit of buildings with geoexchange systems frequently adds cooling capability to buildings that previously were only heated. Consequently, the energy use of the retrofitted building will include cooling energy. In this situation, the analyst should exclude cooling energy and costs from the analysis that would distort savings calculations. However, the increased energy use and costs due to cooling must be explained so that the client understands the potential for an increase in total energy costs.

Wind Turbines

A on-line system is available for making a preliminary wind turbine feasibility study from the Iowa Energy Center at http://www.energy.iastate.edu. Wind turbine analysis is to be done using life cycle cost analysis as compared to status quo or "do nothing" option. The turbine evaluation should consider capacity as compared to facility needs over a 25-year study period using current US Department of Energy indices. The Energy and Waste Management Bureau's engineering staff is available for consultation. Contact Lee Vannoy at (515) 281-6559.

Roof Insulation

Wells Fargo Investment Services will finance complete roof replacements, therefore, roof insulation EMIs can show either the cost of the entire project or just the cost of insulation. The client's financing plans will determine which cost to use in the payback calculation. It may be necessary to calculate the EMI with both cost figures before the client can make a decision. The analyst's recommendation should be shown in the Energy Management Plan.

EMI Development Sheet – Part 1

EMI No.: ____ EMI Title: _____ EMI Type: ____

Institution _____ Building _____

1. Description of existing conditions:

2. Description of energy management improvement:

3. Energy savings calculations:

4. Energy cost savings calculations:

5. Non-energy cost savings:

6. In-house maintenance labor savings (in hours/year):

EMI Development Sheet – Part 2

EMI No.: ____ EMI Title: _____ EMI Type: ____

Institution _____ Building _____

7. EMI cost estimates:

   Material:

   Labor:

   Design:

   Management Fee (includes energy services company (ESCO) or performance contract overhead and profit charges, and/or construction management costs):

   Rebate (if any):

   Net cost after rebate:

   Method of cost determination:

8. Simple payback period calculation (Net cost / total savings per year):

9. Useful life: _____ years

10. Salvage value or disposal cost at the end of the useful life: $_____

Appendices

Appendix A: Calculations and Supporting Documents
There are no required forms. Use this section for lengthy supporting documents (i.e., computer modeling input and output data, rebate program information, lighting analysis, utility billing, etc).

Appendix B: Other Supporting Information
There are no required forms. This appendix is included when there are miscellaneous documents which do not fit into other categories.

Appendix C: RFP and Technical Engineering Analysis contract
Place a photocopy of the Request for Proposals and the signed Technical Engineering Analysis contract in the appendix. This is useful information to the client and reviewer to see if report objectives were met. This information is also required prior to BEM financing approval.

ENERGY MANAGEMENT PLAN

The analyst develops the Energy Management Plan (page 34) before the completion of the TEA. The EMP is to incorporate all EMIs of all facilities studied under the TEA contract. The EMP is the document representing the end product of the contract and serves as a plan of action for the client. If necessary, the analyst is to provide narrative text explaining the contents of the EMP and summarize the contents of the EMP form. For **each** EMI this form records the analyst's recommendation whether to implement and when to implement. This information is recorded on the EMP and is submitted **with** the TEA report(s) to the Department.

Energy Management Plan

Institution _____ Number (if any) _____ Page ____ of ____

EMI #	EMI Code	EMI Title	Electricity Savings (kWh)	Natural Gas Savings (Therms)	Fuel Savings (units)	Non-Energy Savings ($)	Annual Cost Savings ($/yr)	Net Est. Cost ($)	Simple Payback (yrs)	C-E[1] Y or N	Rec.[2] Y or N	Implementation Date	Method of Financing
		Totals											

Note 1: C-E meaning cost-effective per Energy Bank Guidelines for Cost-Effective Energy Management Improvement Projects.
Note 2: Analyst's recommendation for implementation that may not meet cost-effective criteria (although partial financing may be available).

SUPPLEMENT

Conversion Factors

Fuel	Conversion Factor
Electricity	3,413 Btu/kWh
Natural Gas	1,000 Btu/CF
Liquid Petroleum Gas	91,500 Btu/Gallon
Fuel Oil #1	137,400 Btu/Gallon
Fuel Oil #2	139,600 Btu/Gallon
Fuel Oil #4	145,100 Btu/Gallon
Fuel Oil #5	148,800 Btu/Gallon
Fuel Oil #6	152,400 Btu/Gallon

Purchased Services:

Steam	1,000 Btu/lb
Hot Water	1,000,000 Btu/MMBtu
Chilled Water	12,000 Btu/ton-hr

Other Useful Conversion Factors

1 Therm	=	100,000 Btu
1 Horsepower	=	746 W
1 Horsepower-hr	=	2,547 Btu
1 Boiler Horsepower	=	33,520 Btu/hr
MBtu (Roman numerals)	=	1,000 Btu
MMBtu (Roman numerals)	=	1,000,000 Btu

Iowa County Numbers

1	Adair	34	Floyd	67	Monona
2	Adams	35	Franklin	68	Monroe
3	Allamakee	36	Fremont	69	Montgomery
4	Appanoose	37	Greene	70	Muscatine
5	Audubon	38	Grundy	71	O'Brien
6	Benton	39	Guthrie	72	Osceola
7	Black Hawk	40	Hamilton	73	Page
8	Boone	41	Hancock	74	Palo Alto
9	Bremer	42	Hardin	75	Plymouth
10	Buchanan	43	Harrison	76	Pocahontas
11	Buena Vista	44	Henry	77	Polk
12	Butler	45	Howard	78	Pottawattamie
13	Calhoun	46	Humboldt	79	Poweshiek
14	Carroll	47	Ida	80	Ringgold
15	Cass	48	Iowa	81	Sac
16	Cedar	49	Jackson	82	Scott
17	Cerro Gordo	50	Jasper	83	Shelby
18	Cherokee	51	Jefferson	84	Sioux
19	Chickasaw	52	Johnson	85	Story
20	Clarke	53	Jones	86	Tama
21	Clay	54	Keokuk	87	Taylor
22	Clayton	55	Kossuth	88	Union
23	Clinton	56	Lee	89	Van Buren
24	Crawford	57	Linn	90	Wapello
25	Dallas	58	Louisa	91	Warren
26	Davis	59	Lucas	92	Washington
27	Decatur	60	Lyon	93	Wayne
28	Delaware	61	Madison	94	Webster
29	Des Moines	62	Mahaska	95	Winnebago
30	Dickinson	63	Marion	96	Winneshiek
31	Dubuque	64	Marshall	97	Woodbury
32	Emmet	65	Mills	98	Worth
33	Fayette	66	Mitchell	99	Wright

Operation and Maintenance Titles

Building Envelope Insulation
---Combination roof/ceiling and wall insulation
---Other insulation measures
---Roof/Ceiling insulation
---Wall insulation
Building Envelope Infiltration Control
---Infiltration control
Building Envelope Fenestration/Windows
---Double glazing
---Other window measures
---Reflective film
---Replace glass with insulated panels
---Storm windows
---Triple glazing
---Wall up or close off
Building Envelope Other Openings (e.g. doors, loading docks, etc.)
---Air locks or vestibules
---Other door/miscellaneous measures
---Storm doors
---Wall up or close off openings
Renewable Solar
---Active solar space conditioning
---Passive solar space conditioning
---Photovoltaic application
---Solar hot water
Renewable Wind, Hydro
---Use of water power
---Use of wind energy
Mechanical Systems Non-Renewable Conversions
---Conversion to another non-renewable fuel
---Conversion to coal
---Conversion to electricity
---Conversion to natural gas
---Conversion to oil
Mechanical Systems Controls
---Central control/automated energy management
---Enthalpy control
---Other control devices (day/night, demand control, etc.)
---Shut down/shut off devices
---Temperature reset devices
Mechanical Systems Air-Conditioning
---Chiller conversion /efficiency improvement
---Install economizer
---Other air-conditioning measure
---Package unit application
Mechanical Systems Domestic Water
---Decentralized hot water heater
---Install flow restrictors
---Insulate tanks
---Other water measure
---Reduce circulation pump operation

Operation and Maintenance Titles

Mechanical Systems Other
---Cogeneration application
---Install energy recovery devices
Mechanical Systems Heating Modifications
---Downsize system
---Install automatic flue damper
---Install automatic ignition device
---Install humidification device
---Install stack economizer
---Install turbulators
---Other heating modification
---Preheat combustion air/make up water
---Replace boiler
---Replace burner
Mechanical Systems Air Distribution System Modifications
---HVAC retrofit or replacement
---Install automatic dampers
---Install variable air volume system
---Insulate pipes or ductwork
---Other distribution system modification
---Prevent air stratification
---Reduce air volume
---Repair/Replace steam traps
---Zoning modifications
Swimming Pools
---Install swimming pool cover
---Pool dehumidification
---Pool heat recovery
Lighting Conversions
---Convert exit light fixtures to LED exit fixtures
---Convert to fluorescent lights
---Convert to high intensity discharge (HID) lamps
---Convert to other high efficiency lamps
---Convert to T8s and electronic ballasts
---Install reduced wattage fluorescent lamps
Lighting Modifications
---Disconnect ballasts
---Install energy efficient ballasts
---Modify fixture (e.g. reflectors, lower height, etc.)
---Other lighting modification
---Reduce number of fixtures/task lighting
Electrical/Lighting Controls
---Electrical system control devices
---Install demand limiter controls
Electrical/Lighting Motors
---Down size motors
---Install energy efficient motors
---Install VFDs
---Other motor modification
Other Electrical
---Other electrical applications

Energy Management Improvement Codes and Useful Lives

Building Envelope Insulation
BRC: Combination roof/ceiling and wall insulation (25 years)
BRO: Other insulation measures (25 years)
BRR: Roof/Ceiling insulation (25 years)
BRW: Wall insulation (25 years)
Building Envelope Infiltration Control
BIZ: Infiltration control (10 years)
Building Envelope Fenestration/Windows
BFD: Double glazing (25 years)
BFX: Other window measures (15 years)
BFF: Reflective film (15 years)
BFI: Replace glass with insulated panels (25 years)
BFS: Storm windows (25 years)
BFT: Triple glazing (25 years)
BFW: Wall up or close off (25 years)
Building Envelope Other Openings (e.g. doors, loading docks, etc.)
BOA: Air locks or vestibules (25 years)
BOX: Other door/miscellaneous measures (25 years)
BOS: Storm doors (25 years)
BOW: Wall up or close off openings (25 years)
Renewable Solar
RSA: Active solar space conditioning (10 years)
RSP: Passive solar space conditioning (20 years)
RSV: Photovoltaic application (10 years)
RSW: Solar hot water (10 years)
Renewable Wind, Hydro
RGZ: Use of water power (10 years)
RBZ: Use of wind energy (20 years)
Renewable Conversions
RCB: Conversion to biomass (25 years)
RCM: Conversion to methane (25 years)
RCX: Conversion to other renewable (25 years)
RCR: Conversion to refuse (25 years)
RCW: Conversion to wood (25 years)
RCG: Geothermal heat pump (19 years)
Mechanical Systems Non-Renewable Conversions
MCX: Conversion to another non-renewable fuel (25 years)
MCC: Conversion to coal (25 years)
MCE: Conversion to electricity (25 years)
MCG: Conversion to natural gas (25 years)
MCO: Conversion to oil (25 years)
Mechanical Systems Controls
MKC: Central control/automated energy management (15 years)
MKE: Enthalpy control (15 years)
MKX: Other control devices (day/night, demand control, etc.) (15 years)
MKS: Shut down/shut off devices (15 years)
MKT: Temperature reset devices (15 years)

Energy Management Improvement Codes and Useful Lives

Mechanical Systems Air-Conditioning
MAC: Chiller conversion /efficiency improvement (25 years)
MAE: Install economizer (15 years)
MAX: Other air-conditioning measure (15 years)
MAU: Package unit application (25 years)
Mechanical Systems Domestic Water
MWD: Decentralized hot water heater (15 years)
MWF: Install flow restrictors (20 years)
MWI: Insulate tanks (20 years)
MWX: Other water measure (15 years)
MWC: Reduce circulation pump operation (10 years)
Mechanical Systems Other
MOG: Cogeneration application (20 years)
MOE: Install energy recovery devices (10 years)
Mechanical Systems Heating Modifications
MHD: Downsize system (25 years)
MHF: Install automatic flue damper (10 years)
MHA: Install automatic ignition device (10 years)
MHH: Install humidification device (10 years)
MHE: Install stack economizer (15 years)
MHT: Install turbulators (15 years)
MHX: Other heating modification (10 years)
MHP: Preheat combustion air/make up water (20 years)
MHO: Replace boiler (25 years)
MHB: Replace burner (25 years)
Mechanical Systems Air Distribution System Modifications
MDR: HVAC retrofit or replacement (20 years)
MDO: Install automatic dampers (10 years)
MDV: Install variable air volume system (15 years)
MDI: Insulate pipes or ductwork (20 years)
MDX: Other distribution system modification (10 years)
MDS: Prevent air stratification (15 years)
MDA: Reduce air volume (15 years)
MDT: Repair/Replace steam traps (15 years)
MDZ: Zoning modifications (10 years)
Swimming Pools
MPC: Install swimming pool cover (10 years)
MPD: Pool dehumidification (15 years)
MPR: Pool heat recovery (15 years)
Lighting Conversions
ECL: Convert exit light fixtures to LED exit fixtures (25 years)
ECF: Convert to fluorescent lights (20 years)
ECH: Convert to high intensity discharge (HID) lamps (20 years)
ECX: Convert to other high efficiency lamps (8 years)
ECE: Convert to T8s and electronic ballasts (20 years)
ECW: Install reduced wattage fluorescent lamps (10 years)

Energy Management Improvement Codes and Useful Lives

Lighting Modifications
EMD: Disconnect ballasts (20 years)
EMB: Install energy efficient ballasts (20 years)
EMF: Modify fixture (e.g. reflectors, lower height, etc.) (8 years)
EMZ: Other lighting modification (10 years)
EMR: Reduce number of fixtures/task lighting (20 years)
Electrical/Lighting Controls
EKZ: Electrical system control devices (10 years)
EKD: Install demand limiter controls (10 years)
Electrical/Lighting Motors
MMS: Down size motors (20 years)
MME: Install energy efficient motors (20 years)
MMV: Install VFDs (20 years)
MMX: Other motor modification (20 years)
Other Electrical
EEZ: Other electrical applications (10 years)

QUALIFICATIONS FOR ANALYSTS

I. Qualifications for Prospective Analysts
1. Licensed Professional Engineer or registered Architect in the State of Iowa.
2. Demonstrate knowledge and experience in energy management/energy conservation matters (see Section III below).
3. Free from any conflicts of interest (financial or otherwise) in any of the energy management improvements/energy conservation measures.
4. Prospective Analysts will be considered probationary until the next Annual Analyst Workshop, at which time they will be placed on the List of Qualified Analysts. Attendance at the Annual Analyst Workshop is mandatory.

II. Requirements for Continuing Analysts
1. Licensed Professional Engineer or registered Architect in the State of Iowa.
2. Free from any conflicts of interest (financial or otherwise) in any of the energy management improvements/energy conservation measures.
3. Attendance at the Department's Annual Analyst Workshop. Analysts will be removed from program participation for failure to attend. Those on the List of Qualified Analysts will be eligible to receive client Requests For Proposals to perform Technical Engineering Analyses.

III. Demonstrate Knowledge and Experience in Energy Management

Submission and approval of one of the following:
1. A TEA in accordance with the current edition of the Department's Technical Engineering Analysis Guidelines.
2. A TEA prepared for another governmental agency or body which provides the data identified in a Department TEA, in a similar format, including but not limited to:
    i. Executive Summary
    ii. Building Description
    iii. Current Energy Consumption Analysis (model)
    iv. Review of Operation and Maintenance (O&M) Practices and Procedures
    v. EMI Analysis Documentation
3. Reports, studies, or analyses which demonstrate competency in all of the following areas:
    i. Building electrical load analysis
    ii. Building fuel load analysis
    iii. Air/Hydronic HVAC systems analysis
    iv. Lighting systems analysis
    v. Building energy modeling analysis
    vi. Building O&M practices and procedures analysis
    vii. EMI analysis
    viii. Envelope systems analysis
    ix. Heating and cooling plant analysis
    x. Other energy system analysis as requested and approved by the Department
4. Other credentials, documents, or information that materially demonstrate ability to prepare TEAs in accordance with the Department's current TEA Guidelines.

Note: For submissions under line items III.2, III.3, III.4 above, it is the responsibility of the prospective analyst to provide a table of contents that clearly cross references the

above requirements to the material submitted. Failure to do so may result in rejection of the submission.

IV. Causes for Disqualification

1. Substantial Errors
    i. Substantial errors in the TEA (including failure to comply with TEA Guidelines) or in subsequent design, construction, or contract management (incorrect calculations, missing information, conflicting data, design mistakes, etc.) result in the delay of implementing EMIs. Inferior quality during any phase of implementation diminishes program effectiveness and value to the facility owner. Substantial errors in any work performed by a Qualified Analyst for any client of the Iowa BEM Program, including but not limited to, the TEA, design and construction or project management, shall be cause for disqualification. Under no circumstances are TEA reports to be done without a comprehensive walk-through of the facility under review.
    ii. A letter will be sent to the analyst indicating deficiencies in the report or EMI implementation. Unless deficiencies are resolved to the satisfaction of the client and the Department within the stated timeline, the analyst will receive a Notice of Disqualification and Removal from the Energy Bureau's List of Qualified Analysts. The disqualified analyst will not be allowed to participate in any new contracts with the BEM Program until re-qualified by the Department.
2. Untimely or Non-Performance
    a. Failure to perform a TEA in a timely manner is detrimental to the facility and the program. This includes delays in the completion of a TEA, failure to respond to DNR's inquiries or requests for TEA revisions and clarifications in a timely manner, or delays in subsequent EMI implementation. Therefore, it is necessary to take administrative action in such cases.
    b. A letter will be sent to the analyst indicating untimely or non-performance in executing their TEA contract or subsequent EMI implementation performance. Upon review of input from the analyst, a decision will be made by the Department as to the analyst's qualification status. Possible outcomes range from unchanged status to disqualification.
3. The disqualified analyst will not be allowed to participate with the BEM Program until re-qualified by the Department (see V. below).

V. Reinstatement to Qualified Analyst

1. Individuals who are disqualified as analysts may attend the Annual Analyst Workshop, and submit a new sample TEA for review while disqualified. If that individual meets the conditions of Section I, they may be reinstated one (1) year after their disqualification date.
2. Analysts who have allowed their qualifications to lapse and have been removed from the Department's List of Qualified Analysts can be reinstated by meeting the conditions stated in Section I and V.1.

TECHNICAL ENGINEERING ANALYSIS CONTRACT
IOWA ENERGY BANK PROGRAM

Contract Title: Technical Engineering Analyses of Facilities of _____

		FACILITY NAME	TOTAL SQUARE FOOTAGE
Relevant Facilities	**1)**	_____	
	2)	_____	
	3)	_____	
	4)	_____	

DATE

TECHNICAL ENGINEERING ANALYSIS AGREEMENT
IOWA ENERGY BANK PROGRAM

Client Name: _____

Client Contract Officer: _____

Analyst: _____

Analyst's Contract Officer: _____

Contract Title: Engineering Analyses of Certain Facilities of the: _____

Distribution of Copies

Copy 1: Client Copy 2: Analyst Copy 3: Iowa DNR

Time of Performance: _____

Submit Original Invoice and Duplicate to:

Facility
Address
City, Iowa Zip

Issue payment to:

Iowa Department of Natural Resources
Energy and Waste Management Bureau
Wallace State Office Building
502 E. 9th Street
Des Moines, Iowa 50319

This Contract is executed in two (2) counterparts, each of which shall constitute one and the same instrument. **IN WITNESS WHEREOF, the parties hereto have executed this Contract.**

(Analyst) _____	**(Facility)** _____
ANALYST	**CLIENT NAME**
***BY:** _____	**BY:** _____
TYPED NAME: _____	**TYPED NAME:** _____
TITLE: _____	**TITLE:** _____
DATE: _____	**DATE:** _____

** must be an officer of the Analyst's Firm*

Article I. Definitions

Terms used herein unless otherwise defined shall have the same meaning as used in this Article 1

1.1 "Analyst" means a licensed Professional Engineer in the State of Iowa or a Certified Energy Manager (CEM) that has met the requirements of the Department defined in current Energy Audit Guidelines as a Qualified Energy Auditor.

1.2 "Average Simple Payback period" means the total estimated costs of all energy management improvements divided by the total estimated annual cost savings.

1.3 "Area Education Agency" means an area education agency created and established pursuant to Iowa Code Chapter 273, as amended.

1.4 "Beginning Date" means date agreed by all parties that the facility will be made available and Auditor may begin data collection.

1.5 "Client" means any public school, community college, local government, hospital, or private college in the state of Iowa that is determined to be eligible for the Energy Bank Program.

1.6 "Community School District" or "CSD" means a public school corporation body politic, three hundred seventy-four (374) of which comprise the geographic territory of the State of Iowa, which furnishes education services and programs pursuant to Chapter 274 and 275, Iowa Code, to pupils enrolled in public schools located within its boundaries, including CSD exercises exclusive jurisdiction in all school matters within it boundaries, including the ownership, operation, and maintenance of buildings and facilities used for its purposes.

1.7 "Database" means the Department's computerized system of energy audit data and Project walk-through energy audits and facility data. The Database contains data from the Energy Analysis, and shall be the basis of the energy data inventory collected for each facility and be used to analyze said facility. Information from the technical engineering analysis is also entered into the Database and is used as a basis for periodic monitoring and accounting purposes.

1.8 "Department" or "DNR" means the Iowa Department of Natural Resources or any successor to and my agents thereof.

1.9 "Ending Date" means latest date agreed by all parties that the complete and approved study shall be distributed per contract.

1.10 "Energy Use Index" or "EUI" means the collection of energy and building data by means of a walk-through energy audit performed during a visit or visits to a facility.

1.11 "Energy Management Improvements" or "EMIs" means construction, rehabilitation, acquisition, or modification of an installation in a building, which is intended to reduce energy consumption or energy costs, or both, or allow the use of an alternative energy source, which may contain integral control and measurement devices. This may include fuel switching or electric demand measures.

1.12 "Energy Management Plan" means the description of how the projects, which are currently cost effective, will be implemented. It shows how the facility owner intends to use the information provided in the TEAs. The plan consists of narrative text addressing which projects have been recommended by the Analyst for implementation immediately; which projects will be implemented during equipment replacement; how the projects will be financed and when the projects will be implemented.

1.13 "Engineering Analysis" or "Technical Engineering Analysis" means a comprehensive examination and written report of a Facility conducted to identify conservation opportunities with estimated costs of the improvements, including design, materials and installation, estimated annual cost savings by fuel type, life cycle cost analysis and simple payback period, which shall be signed and certified by an Iowa certified professional engineer who is either an employee or duly authorized agent of the Analyst.

1.14 "Facility" means any buildings owned or leased to a CSD, merged area school, area education agency, local government, municipality, political subdivision, hospital or private college in the state of Iowa, utilizing heating, cooling or lighting systems, and which includes, but is not limited to, classroom buildings, gymnasiums, office buildings, courthouses, police and fire stations, garages, storage buildings, modular and other movable buildings, dormitories, training centers, swimming pools, patient rooms and assembly or meeting buildings. Modular and other movable buildings located next to or in conjunction with a building shall be regarded as part of the Facility. Any of the above buildings, which are physically connected, one to the other, shall constitute one facility. If necessary, the Department shall make the final determination, on a case-by-case basis, of what constitutes one Facility.

1.15 "Hospital" means a public or nonprofit institution, which is a general hospital, tuberculosis hospital, or any other type of hospital, other than a hospital furnishing primary domiciliary care; and is duly authorized to provide hospital services under the laws of the state of Iowa.

1.16 "Local Government" means the government of a county, municipality or township that is a unit of general purpose government below the state, determined on the basis of the same principles as are used by the bureau of the census for general statistical purposes.

1.17 "Operation and Maintenance Procedure" or "O&M" means those procedures and measures utilized to manage the Facility and equipment systems thereto and which, if modified for greater energy efficiency, entail minimal capital expenditures. Some recommended O&Ms shall have calculated coats and computed payback savings presented in the Engineering Analysis.

1.18 "Private College" means those facilities in Iowa offering education beyond the secondary level and not publicly owned or operated.

1.19 "Project" means the Technical Engineering Analyses for all eligible Facilities.

1.20 "Project Manager" means the Project resident individual designated and employed by the Analyst who is responsible for implementing the Analyst's scope of work stated herein on a daily basis, who shall manage and supervise the Analyst's employees, and who is accountable to the School District, Local Government, Hospital of Private College for the Project, The Project Manager shall have authority in making all the Analyst's Project decisions in carrying out the project.

Article II. Identification of Parties and Designation of Officials

2.1 Parties. This contract is entered into by and between the Analyst and the Client (School District, Local Government, Hospital, Private College) for services to perform engineering analyses.

Representative & Position, is the official authorized to execute this Contract and any changes thereto on behalf of **Client**.

Client Representative, or his designee is authorized by the **Facility** to negotiate on its behalf.

2.2 Client Representative

Contract Officer (Name) _____
(Address) _____
(Telephone) _____
(Fax) _____
(E-mail) _____

2.3 Analyst's Key Personnel

Contract Officer (Name) _____
(Address) _____
(Telephone) _____
(Fax) _____
(E-mail) _____

Article III. Statement of Purpose

This Contract is entered into for the purpose of identifying and recommending certain improvements, including Energy Management Improvements and Operating and Maintenance procedures for certain Facilities of the Client which will result in greater energy efficiency and conservation in the heating, cooling and lighting of said Facilities.

Article IV. Time of Performance

The Analyst shall commence work on this Contract on the Beginning Date and complete all Contract obligations no later than the Ending Date as set forth in Article I of this Contract. No costs can be incurred before the Beginning Date or after the Ending Date as set forth in Article I.

Article V. Scope of Work

5.1 The Project.

A. The Analyst agrees to provide a Technical Engineering Analysis (TEA) for each Facility identified on the title page of this Contract. The Engineering Analysis shall be submitted to the Client according to the schedule as specified in Section 5.2 hereof and in accordance with the Department's current *Technical Engineering Analysis Guidelines*. If there is a conflict between the schedule in Section 5.2, the Client must approve the revised schedule in writing.

B. The Analyst agrees to submit the TEA to the Department for review and approval. Within 20 days of receipt of the TEA, the Department shall approve the TEA or reject the TEA for failing to conform to the requirements of this Contract or the current TEA Guidelines and shall so notify the Analyst in writing of the approval or the rejection, and if rejected, the reasons for the rejection. If the TEA is rejected, the Analyst shall thereupon, in consultation with the Department, prepare revisions to the TEA for the Facility. The Analyst shall provide the revised TEA, which affirmatively address the reasons for rejection no later than fifteen (15) days after receiving the Department's comments. Upon the submission of timely and accurate revisions to the TEA, the Department will approve the analysis based upon the calculations and recommendations of the Analyst.

C. The Analyst covenants that the current TEA Guidelines were followed, and that the energy calculations for each energy improvements, including the cost savings and construction costs shall be included in the TEA.

5.2 Schedule. The Analyst and the Client agree to perform the following duties according to the following schedule:

Final Date For Completion	Duty
_____	The Analyst has initial meeting with the Client and the Energy Bank marketer to secure scope of analysis.
_____	The Beginning Date when the Analyst begins work on the TEA.
_____	The Analyst submits the TEA and Energy Management Plan for each facility to the Department of review and approval.

a) This TEA shall be in accord with the current TEA Guidelines.

_____ b) If applicable, the Analyst submits all revisions to the Engineering Analysis and returns all materials provided by the Client.

_____ The Ending Date when the Analyst submits the Final (approved) TEA to the Client.

_____ Client and the Energy Bank Marketer review the Analyst's recommendations in the Energy Management Plan and identify EMIs for financing.

5.3 Scheduling Facility Visits. The Analyst shall notify the Client and Facility representatives thereof, of a proposed visit to said Facility or Facilities at least five (5) calendar days in advance of the proposed visit. If subsequent to such notice the Analyst must make a change in the proposed visit schedule for cause, the Analyst shall provide the revised schedule to the appropriate Facility representative at least forty-eight (48) hours prior to the originally scheduled visit, except in cases of emergency, when notification shall be made as soon as feasibly possible.

5.4 Access. The Client shall be responsible to ensure timely access to each of the Facilities and shall coordinate a schedule mutually convenient to the Client and the analyst.

5.5 Thoroughness of TEA at Facility. The Analyst and the Client agree that the adequacy of TEA is dependent on the Analyst spending sufficient time to visit and inspect each facility. Therefore, the Analyst shall conduct a thorough on-site inspection of each Facility necessary to identify all potential O&M and EMIs as required by the current TEA Guidelines, provided by the Department (http://www.iowadnr.com/energy/news/publications.html), for each Facility.

5.6 Facility Information Provided to Engineering Analysts.

A. It shall be the responsibility of the Client to collect and provide to the Analyst all appropriate construction data and blueprints, past energy consumption records of the previous state fiscal year (July 1- June 30th), electricity, and natural gas and other fuels rate schedules, plans and specifications, and other details shall be used to determine simulated energy usage.

B. The information derived from the plans and specifications and the Facility visit including construction details, wall and roof areas, glass types and areas, building orientation, verification requirements and other details shall be used to determine simulated energy usage.

5.7 Problems Encountered at Facility. The Analyst shall notify the Client immediately of any lack of cooperation, accidents, or other such problems encountered by the Engineering Firm in the performance of the Engineering Analyses at the Facility. The Analyst shall insure that its personnel are adequately covered by insurance and shall hold harmless the client and the

Department from all liabilities, fees, expenses, taxes, cause of action, suits, claims, demands and other costs incurred by the Client or the Department (including, but not limited to, attorney's fees and expenses, court fees and other costs of litigation or non-litigation dispute resolutions) arising out of the performance of Analyst's obligations under this Contract.

5.8 Energy Management Plan. The Analyst, in addition to submitting the written TEA to the Client, shall prepare and submit with the completed TEA s an Energy Management Plan that encompasses all of the facilities receiving a TEA.

5.9 Ending Date. The TEA for the Project must be completed by _____.

Article VI. Reports

The Analyst shall submit the following reports:

6.1 One (1) copy of the TEA for each Facility and the Energy Management Plan to the Department for review and approval.

6.2 The Analyst shall mail one (1) copy of the Revised TEA (or submission of requested documentation) for each Facility and the Energy Management Plan to the Department for final review and approval. The Analyst shall ensure that an up-dated Energy Management Plan also accompanies the revised Engineering Analysis.

6.3 Upon Department review and approval, the Analyst shall ensure that the Department receives one approved version of the TEA and that the Client receives one copy of the approved TEA for their record.

Article VII. Payment

7.1 The Client shall pay the Analyst XX thousand dollars $ _____ for all the work performed on the Project subject to approval of the TEA by the Department.

7.1.1 Cost of the TEA as proposed by the Analyst is based upon the square footage of the facility as reported by the Client on the Memorandum Of Agreement. If the actual square footage of the facility is determined to vary more than 2% from that reported, the analyst shall cease work and immediately notify the Department of the discrepancy and the proposed difference in cost. The Department shall obtain a signed adjustment acknowledgment from the Client prior to continuance of the Analysis. If the facility proves to be more than 2% smaller than originally reported, the analyst shall issue a signed cost adjustment.

7.2 The Client shall make a payment for the work after receipt of the TEA for the Project, if: the TEA is approved through the Department without modification, or the Revised TEA has been reviewed and approved by the Department within the required timeframe outlined in Article 5.1, Subsection B.

Article VIII. Review of Work

8.1 The Client and the Department shall have the right to review, at any time, complete work or work in progress by the Analyst on the project.

8.2 The Analyst shall be available to discuss the findings contained within the submitted Technical Engineering Analysis within thirty (30) calendar days of the Client's receipt of said reports.

Article IX. Termination

In the event of the breach of any provision of this Contract by the Analyst, the Client shall provide written notification of such breach to the Analyst, and if the Analyst fails to remedy such breach within fifteen (15) days after provision of written notification by the Client of such breach, the Client may terminate this Contract by providing written notice to the Analyst. The Analyst shall, thereupon, immediately cease its work on the Project, submit a claim to the Client for the work undertaken by the Analyst to the date of termination and not previously paid by the Client and turn over to the Client all reports, documents and other information to the Project which the Analyst has prepared, whether or not complete. The Analyst shall return all materials supplied by the Client or taken from Facilities with respect to the Project within one week of termination.

The aforementioned claim by the Analyst shall be paid by the Client if the Client determines, in its sole discretion, that the work performed by the Analyst for which the claim was submitted: (a) conforms to all specifications of this Contract; (b) did not result in the breach giving rise to termination of the Contract under this Article IX; (c) can be used by the Client to obtain a Technical Engineering Analysis which satisfies the requirements set forth in the current Energy Analysis Guidelines. The failure to notify the Analyst of a breach of this Contract shall not be deemed a waiver of such breach and the waiver of any breach shall not be deemed a waiver of any subsequent breach.